Claims

1. A rare earth oxide superconductor comprising a metal substrate; an intermediate layer formed on the surface of the metal substrate by sequentially disposing a first intermediate layer comprising cerium and a solid solution formation element capable of forming a solid solution with cerium, and a second intermediate layer comprising cerium and a charge compensation element capable of compensating for a charge mismatch attributable to a difference between the electron valences of respective ions of cerium and the solid solution formation element; and a rare earth oxide superconductive layer formed on the intermediate layer.

2. A rare earth oxide superconductor comprising a metal substrate; an intermediate layer formed on the surface of the metal substrate by sequentially disposing a first intermediate layer comprising cerium and a solid solution formation element capable of forming a solid solution with cerium, and a second intermediate layer comprising cerium, the solid solution formation element and a charge compensation element capable of compensating for a charge mismatch attributable to a difference between the electron valences of respective ions of cerium and the solid solution formation element; and a rare earth oxide superconductive layer formed on the intermediate layer.

3. A rare earth oxide superconductor comprising a metal substrate; an intermediate layer formed on the surface of the metal substrate, comprising cerium, a solid solution formation element capable of forming a solid solution with cerium, and a charge compensation element capable of compensating for a charge mismatch attributable to a difference between the electron valences of respective ions of cerium and the solid solution formation element; and a rare earth oxide superconductive layer formed on the intermediate layer.

4. The rare earth oxide superconductor according to any of claims 1 to 3, wherein the solid solution formation element consists of any of 1 type or 2 types or more of rare earth elements of Y, Nd, Sm, Gd, Eu, Yb, Ho, Tm, Dy, La and Er.

5. The rare earth oxide superconductor according to any of claims 1 to 3, wherein the charge compensation element consists of any of 1 type or 2 types or more of Bi, Nb, Sb, Ta and V.

6. The rare earth oxide superconductor according to any of claims 1, 2 and 4, wherein the content of the solid solution formation element of the first intermediate layer is 5 to 60 mol% in terms of the metal content.

7. The rare earth oxide superconductor according to any of claims 1, 4, 5 and 6, wherein the content of the charge compensation element in the second intermediate layer is 5 to 60 mol% in terms of the metal content.

8. The rare earth oxide superconductor according to any of claims 2, 4, 5 and 6, wherein the summation of the solid solution formation element and the charge compensation element in the second intermediate layer is 5 to 60 mol% in terms of the metal content.

9. The rare earth oxide superconductor according to any of claims 3, 4 and 5, wherein the summation of the solid solution formation element and the charge compensation element in the intermediate layer is 5 to 60 mol% in terms of the metal content.

10. The rare earth oxide superconductor according to claim 8 or 9, wherein the mole ratio of the charge compensation element to the solid solution formation element is charge compensation element/ solid solution formation element ≤ 1.2.

11. The rare earth oxide superconductor according to any of claims 1 to 10, wherein the metal substrate is a biaxially aligned metal substrate.

12. A method for producing a rare earth oxide superconductor comprising the steps of applying a mixed solution, on the surface of a metal substrate, comprising an organometallic acid salt of cerium and an organometallic acid salt of any 1 type or 2 types or more of solid solution formation elements capable of forming a solid solution with cerium selected from (Y, Nd, Sm, Gd, Eu, Yb, Ho, Tm, Dy, La and Er) and then preliminarily calcining the same to form a first coated layer; applying a mixed solution, on the first coated layer,

comprising an organometallic acid salt of cerium and an organometallic acid salt of any of 1 type or 2 types or more of a charge compensation element capable of compensating for a charge mismatch attributable to a difference between the electron valences of respective ions of cerium and the solid solution formation element selected from (Bi, Nb, Sb, Ta and V) to form a second coated layer followed by carrying our a heat treatment in a reducing atmosphere under a pressure ranging from 0.1 Pa to below atmospheric pressure and a temperature ranging from 900 to 1200°C to form an intermediate layer; and then forming a rare earth oxide superconductive layer on the intermediate layer.

13. The method for producing a rare earth oxide superconductor according to claim 12, wherein each of the solid solution formation element in the first coated layer and the charge compensation element in the second coated layer is 5 to 60 mol% in terms of the metal content.

14 A method for producing a rare earth oxide superconductor comprising the steps of applying a mixed solution, on the surface of a metal substrate, comprising an organometallic acid salt of cerium and an organometallic acid salt of any of 1 type or 2 types or more of a solid solution formation element capable of forming a solid solution with cerium selected from (Y, Nd, Sm, Gd, Eu, Yb, Ho, Tm, Dy, La and Er) and preliminarily calcining the same to form a first

coated layer; applying a mixed solution, on the first coated layer, comprising an organometallic acid salt of cerium, an organometallic acid salt of 1 type or 2 types or more of the solid solution formation element, and an organometallic acid salt of 1 type or 2 types or more of the charge compensation element capable of compensating for a charge mismatch attributable to a difference between the electron valences of respective ions of cerium and the solid solution formation element selected from (Bi, Nb, Sb, Ta and V) to form a second coated layer followed by carrying out heat treatment in a reducing atmosphere under a pressure ranging from 0.1 Pa to below atmospheric pressure and a temperature ranging from 900 to 1200°C to form an intermediate layer; and then forming a rare earth oxide superconductive layer on the intermediate layer.

15. The method for producing a rare earth oxide superconductor according to claim 14, wherein each of the solid solution formation element in the first intermediate layer and the summation of the solid solution formation element and the charge compensation element in the second coated layer is 5 to 60 mol% in terms of the metal content.

16. A method for producing a rare earth oxide superconductor comprising the steps of applying a mixed solution, on the surface of a metal substrate, comprising an organometallic acid salt of cerium, an organometallic acid salt

of any of 1 type or 2 types or more of a solid solution formation element capable of forming a solid solution with cerium selected from (Y, Nd, Sm, Gd, Eu, Yb, Ho, Tm, Dy, La and Er), and an organometallic acid salt of any of 1 type or 2 types or more of a charge compensation element capable of compensating for a charge mismatch attributable to a difference between the electron valences of respective ions of cerium and the solid solution formation element selected from (Bi, Nb, Sb, Ta and V) followed by carrying out heat treatment in a reducing atmosphere under a pressure ranging from 0.1 Pa to below atmospheric pressure and a temperature ranging from 900 to 1200°C to form an intermediate layer; and then forming a rare earth oxide superconductive layer on the intermediate layer.

17. The method for producing a rare earth oxide superconductor according to claim 16, wherein the summation of the solid solution formation element and the charge compensation element in the intermediate layer is 5 to 60 mol% in terms of the metal content.

18. The method for producing a rare earth oxide superconductor according to any of claims 12 to 17, wherein the intermediate layer is formed by calcination in a reducing atmosphere under a pressure ranging from 10 to 500 Pa and a temperature ranging from 950 to 1150°C.